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(54) Tibial resection instrument

(57) A cutting guide for resecting a patient's proximal tibia to receive a tibial prosthesis is disclosed. The cutting guide comprises an instrument body (76) and mounting means for attaching the cutting guide to a rod (21) that tracks the patient's intramedullary canal (12) which enables the surgeon to reference surgical cuts with respect to the patient's intramedullary canal. The cutting guide also comprises a cutting element (78) for being driven longitudinally into the proximal tibia during use, and at least one cutting guide surface (90, 91) for guiding a saw instrument of the surgeon.

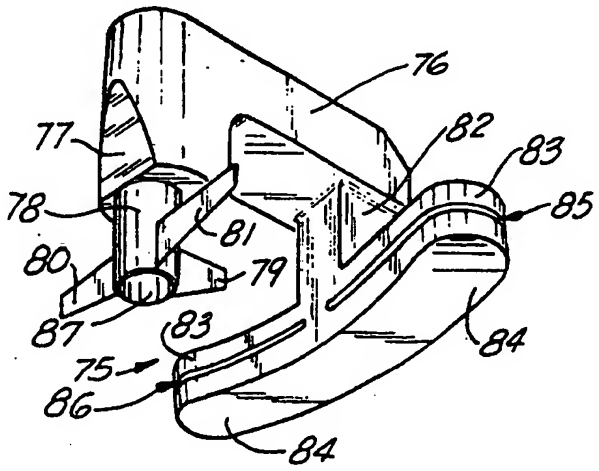

FIG. 23

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Description

[0001] The present invention relates to orthopedic surgical instruments and surgical methods and more particularly relates to an improved apparatus for resecting the patient's proximal tibia for installing a knee prosthesis. Even more particularly, the present invention relates to an improved apparatus for resecting a patients proximal tibia using a preliminary cutting guide and then secondarily cutting the proximal tibia with a secondary cutting guide that has blades that penetrate the proximal tibia, the blades having upper guide surfaces thereon that guide a sawblade during cutting.

[0002] In knee joint replacement surgery, a surgeon typically affixes two prosthesis components to the patient's femur and tibia. These replacement components are typically known as the femoral component and the tibial component.

[0003] The femoral component is placed on a patient's distal femur after the surgeon makes a plurality of surgical cuts. One common type of femoral prothesis has a J-shape. A femoral prosthesis is usually metallic, having a highly polished outer femoral articulating surface.

[0004] A common type of tibial prosthesis uses a laterally extending tray that is shaped to conform to the patient's proximal tibia after the proximal tibia has been cut transversely by the surgeon. The tibia prosthesis also includes a stern or plug that extends generally perpendicular to the tray and from the center of the tray. The stern is placed in a surgically farmed opening that extends into the patient's intramedullary canal from the transverse cut formed on the proximal tibia.

[0005] A plastic, polymeric insert is attached to the tibial tray. This insert provides a tibial articulating surface that articulates with the femoral articulating surface as the patient's tibia moves through a full range of motion with respect to the patient's femur.

[0006] One of the problems with knee joint replacement surgery is that of accurately fitting the patient. Each patient has a different bone structure and geometry. Even though the surgeon uses x-rays to study a particular patient's anatomy at the knee, the surgeon does not have a perfect appreciation of the patient's anatomy until after the knee has been surgically exposed and the surgeon begins to make cuts on the femur and the tibia.

[0007] Knee prosthetic components are not available in infinite sizes. The surgeon must examine the patient's anatomy, make the requisite surgical cuts and install prosthesis components that fit.

[0008] When the surgeon uses bone cement to fix the prosthesis in place, any inconsistencies in the prosthesis fit may, to some extent, be compensated by the bone cement. However, in instances where bone cement is not used, but rather the ingrowth of natural bone is relied on to fix the prosthesis in place, the fit of the prosthesis must be exceptionally good. There is therefore a need to provide tibia resection apparatus which ensures an improved fit for the prosthesis.

[0009] It is an object of the present invention to meet this need.

[0010] When the surgeon uses bone cement to fix the prosthesis in place, any inconsistencies in the prosthesis fit may, to some extent. be compensated by the bone cement However, in instances where bone cement is not used, but rather the ingrowth of natural bone is relied on to fix the prosthesis in place, the fit of the prosthesis must be exceptionally good. There is therefore a need to provide tibia resection apparatus which ensures an improved fit for the prosthesis.

[0011] It is an object of the present invention to meet this need.

[0012] A number of tibial components have been patented that relate to tibial components having a tray, a plastic insert with articulating surface, and a stem portion that provides initial fixation when the prosthesis is implanted. Other patents have issued that relate to cutting instrumentation for preparing the patient's proximal tibia to receive a tibial prosthetic insert as part of knee joint replacement surgery.

[0013] The Murray patent 4,016,606 discloses a knee prosthesis that includes a tibial component with a tray and with a stem adapted to be received in a longitudinal bore in the patient's femur. The stem has one end that is integral with a depending generally spheroidal surface having generally the same radius as the radius of the spheroidal depression in the insert.

[0014] In the Chiarizzio patent 4,601,289 there is disclosed a femoral trial prothesis/rasp assembly used in hip implant surgery. The assembly includes a handle that gaps the combination trial prothesis/rasp in a secure manner by damping over and locking on to a post on the trial prothesis/rasp which later serves as a mounting piece for a femoral prothesis head used in trial reductions.

[0015] A modular tibial prosthesis is disclosed in the Shaw Patent 4,938,769. The Shaw patent discloses a tibial prosthesis for use during a total knee arthroplasty procedure which Includes a modular two part tibial component comprising an in-bone anchorage assembly to which is removably attached a tibial tray adapted to receive and retain a bearing insert. Removal of the tray permits access to the interface between the bone and anchorage assembly in the event removal or revision are necessary. In preferred embodiments, the invention affords hybrid fixation of the tibial prosthesis in that bone cement for immediate fixation and adaptation for longer term bone ingrowth are featured. Shaw also discusses the use of porous coatings to enhance fixation.

[0016] U.S. Patent 4,938,769 issued to James Shaw discloses an end bone anchorage assembly for a tibial prosthesis that includes an axially elongated central stem and a plurality of elongated fixation pegs spaced from the stem. The stem and the pegs have proximal and distal ends. The proximal ends of the stem define

an attachment table. A plurality of structural links interconnect the pegs and the stem. Means is provided for removably attaching a tibial tray to the assembly wherein each of the pegs is connected to the stem by the structural link.

[0017] A tibial component for a replacement knee prosthesis is disclosed in the Lawes et al. Patent 5,080,675. Lawes discloses a tibial component for a replacement knee prosthesis comprising a tibial tray for connection to a suitably prepared tibia, the tray carrying fixed lateral and medial condylar bearing components. Only the medial component has a shock absorber located beneath it.

[0018] U.S. Patent 5,137,536 issued to Tomihisa Koshino describes a tibial component for an artificial knee joint The tibial component includes a plate section having an upper surface and a pair of bearing surfaces parts that are adapted to be in sliding contact with a femoral component. A stem portion extends downwardly from a lower surface of the plate section. A pair of blade like members extend obliquely and posteriorly from the stern. The plate section has a lower surface with a plurality of elongated grooves for improving affinity with respect to the surrounding bone, the grooves including a first group of grooves and a second set of group of grooves extending perpendicularly to the first group of grooves.

[0019] An example of a modular tibial support is seen in the Elias Patent 5,246,459 entitled "Modular Tibial Support Pegs for the Tibial Component of a Prosthetic Knee Replacement System". The Elias Patent discloses a modular tibial support peg operable to secure a tibial component of a knee joint prosthesis to a tibia having a groove. The modular tibial support peg includes a cylindrical body with a ridged outer surface operable to engage the groove in the tibia. The modular tibial support peg further includes a plurality of spikes extending inferiorly from the cylindrical body. The spikes are operable to engage the tibia at the inferior end of the groove.

[0020] It is an aim of embodiments of the present invention to at least partly mitigate the above-referenced problems.

[0021] According to a first aspect of the present invention there is provided a cutting guide for resecting a proximal tibia of a patient to receive a tibial prosthesis, the cutting guide comprising:

a) an instrument body;
b) mounting means for attaching the cutting guide to a rod that tracks the patient's intramedullary canal which enables a surgeon to reference surgical cuts with respect to the patient's intramedullary canal;
c) a cutting element for being driven longitudinally into the proximal tibia during use; and
d) at least one cutting guide surface for guiding a saw instrument of the surgeon.

[0022] According to a second aspect of the present invention there is provided a tibial cutting guide for resecting a patient's proximal tibia to receive a tibial prosthesis comprising:

a) an instrument body having a transverse cutting guide surface thereon for guiding a surgeon's cutting instrument during reshaping of a patient's proximal tibia to receive a tibial prosthesis member;
b) a blade member for forming a connection between the instrument body and the patient's proximal tibia, said blade member having a cutting edge that cuts into the medullary tissue of the patient's proximal tibia during use, embedding the blade in the medullary tissue;
c) a rod for tracking the patient's intramedullary canal, said rod being connectable to the instrument body so that the first cutting guide surface is referenced to the patient's intramedullary canal;

and wherein the blade member has a second cutting guide surface that defines a plane with the first cutting guide surface so that the cutting instrument engages both the first cutting guide surface and the second cutting guide surface during use.

[0023] According to a third aspect of the present invention there is provided a tibial cutting guide instrument for resecting a patient's proximal tibia to receive a tibial prosthesis comprising;

a) A rod arranged to track an intramedullary canal of a patient so that the rod enables a surgeon to reference surgical cuts with respect to the intramedullary canal of the patient;
b) a first cutting guide for guiding a surgical saw during an initial cutting of the patient's proximal tibia; and
c) second cutting guide for enabling the surgeon to shave a layer of tissue from the patient's proximal tibia;

wherein the first cutting guide and the second cutting guide are separately and independently mountable on the rod.

[0024] Embodiments of the present invention provide a tibial cutting guide instrument for resecting a patient's proximal tibia to receive a tibial prosthesis comprising:

(a) an instrument body having mounting means for attaching the instrument body to a patient's proximal tibia
(b) said mounting means including a rod that can track the patient's intramedullary canal so that the rod enables the surgeon to reference surgical cuts with respect to the patient's intramedullary canal;
(c) the body having at least one cutting guide for guiding a surgeon's cutting blade during a cutting of the patient's proximal tibia;
(d) means carried by the instrument body for setting

a depth of cut at either of the patient's medial and lateral condylar surface.

[0025] Preferably, the instrument is provided with one cutting guide.

[0026] Conveniently, the instrument is provided with two cutting guides.

[0027] Advantageously, the cutting guides comprises cutting guide slots.

[0028] Preferably, the instrument body is generally U-shaped.

[0029] Conveniently, the guide slots define a plane that transversely intersects the rod.

[0030] Advantageously, the instrument body comprises stylus means for setting the depth of cut.

[0031] Preferably, the stylus means comprises a stylus probe.

[0032] Conveniently, the instrument is provided with a pair of stylus probes.

[0033] Advantageously, the instrument further comprises means for setting the position of a selected probe so that the surgeon likewise sets the depth of cut.

[0034] Preferably, the stylus probe(s) is adjustably connectable along its length relative to the patient's proximal tibia.

[0035] Conveniently, the probes are adjustable relative to the body and to one another to define a selective depth of cut.

[0036] Advantageously, adjustment of a selected probe relative to the instrument body also adjusts the distance between a selected probe and the cutting guide surfaces.

[0037] Preferably, the probes are independently adjustable relative to the instrument body.

[0038] Conveniently, the probes are generally parallel.

[0039] Preferably, the body further comprises indicia means for indicating the distance between each probe and the cutting guide.

[0040] Conveniently, each stylus probe has a toothed rack thereon, and the instrument body carries means for engaging a selected tooth of the toothed rack.

[0041] Advantageously, the instrument further comprises means for locking a stylus probe to the instrument body at a selected position along the length of the probe.

[0042] Preferably, the second cutting guide is embedded in the tibia during use.

[0043] Conveniently, the instrument comprises an anvil portion that enables the user to drive the second cutting guide into the tibia during use.

[0044] Advantageously, the second cutting guide includes a blade member that can cut into the cancellous tissue of the patient's proximal tibia.

[0045] Preferably, the blade member defines a plane with the first cutting guide.

[0046] Conveniently, the blade member comprises a plurality of radially spaced blade members.

[0047] Advantageously, the blade member(s) occupies a plane that intersects the rod axis.

[0048] Preferably, the blade member has a distal cutting surface and a proximal cutting surface, the proximal cutting surface being the second cutting guide.

[0049] Embodiments of the present invention provide a method for preparing a patient's proximal tibia with a surgical saw and cutting instrumentation to receive a tibial implant comprising the steps of:

a) reaming the patient's tibial intramedullary canal;
b) placing a rod in the intramedually canal;
c) mounting a primary cutting instrument on the rod and above the patients proximal tibia, the primary cutting instrument having transverse cutting guide surfaces for guiding the saw during a cutting of the proximal tibia and a stylus with adjustable stylus member that can reference the proximal tibia before cutting begins;
d) setting a depth of cut with the stylus;
e) engaging the proximal tibial surface with the stylus;
f) cutting the proximal tibia transversely with the saw by tracking the cutting guide surfaces with the saw;
g) removing the primary cutting instrument and its stylus;
h) mounting a secondary cutting instrument on the rod above the patient's proximal tibia, said secondary cutting instrument having a cutter for cutting longitudinally into the proximal tibia; and
i) making a secondary cut on the proximal tibia using the secondary cutting instrument.

[0050] Preferably, the step of cutting the proximal tibia transversely with the saw by tracking the cutting guide surfaces with the saw comprises forming cuts that are generally perpendicular to the rod.

[0051] Conveniently, the step of making a secondary cut on the proximal tibia using the secondary cutting instrument comprises forming cuts with the blade that are generally perpendicular to the rod.

[0052] Advantageously, the step of making a secondary cut on the proximal tibia using the secondary cutting instrument comprises forming cuts with a cutter includes a blade that is flat and having a plane that intersects the rod upon assembly of the second cutting block and the rod.

[0053] Preferably, the step making a secondary cut on the proximal tibia using the secondary cutting instrument comprises forming cuts with a cutter that includes a plurality of flat blades.

[0054] Conveniently, the step of setting a depth of cut with the stylus comprises setting a depth of cut with the stylus by positioning the cutting guide surfaces of the first cutting block a predetermined distance below the lower end of the stylus.

[0055] Advantageously, step of mounting an instrument on the rod and above the patient's proximal tibia, the primary cutting instrument having transverse cutting

guide surfaces for guiding the saw during a cutting of the proximal tibia and a stylus with adiustable stylus member that can reference the proximal tibia before cutting begins comprises mounting a stylus on the rod, the stylus having a beam that supports a first cutting guide thereon, the instrument according to the present invention having transverse cutting guide slots for guiding the saw during a cutting of the proximal tibia, and the first cutting guide is adjustable upon the beam into positions that vary in distance from the rod.

[0056] Preferably, the method of the present invention further comprises the step, between the steps of engaging the proximal tibial surface with the stylus and cutting the proximal tibial transversely with the saw by tracking the cutting guide surfaces with the saw, of securing the stylus to the rod.

[0057] Conveniently, the step of making a secondary cut on the proximal tibia using the secondary cutting instrument comprises making a secondary cut on the proximal tibia using the secondary cutting instrument and registering the saw on the secondary cutter when making the secondary cut.

[0058] Advantageously, there is provided a tibial cutting guide instrument for resecting a patient's proximal tibia to receive a tibial prosthesis comprising:

(a) an instrument body having mounting means for attaching the instrument body to a patient's proximal tibia

(b) said mounting means including a rod that can track the patient's intramedullary canal so that the rod enables the surgeon to reference surgical cuts with respect to the patient's intramedullary canal;

(c) the body having at least one cutting guide for guiding a surgeon's cutting blade during a cutting of the patient's proximal tibia;

(d) means earned by the instrument body for setting a depth of cut at either of the patient's medial and lateral condylar surface.

[0059] Accordingly there is also provided a method of preparing a patient's proximal tibia with a surgical saw and cutting instrumentation.

[0060] The present invention provides an improved method of preparing a patient's proximal tibia with a surgical saw. The method of the present invention uses cutting instrumentation for guiding the saw when shaping the patient's proximal tibia with cuts to receive a tibial implant

[0061] The patient's tibial intramedullary canal is first drilled to receive an intramedullary rod. The surgeon then places the rod in the intramedullary canal and mounts cutting guide instruments to that rod as part of the method of the present invention.

A first cutting instrument is mounted on the rod above the patient's proximal tibia. The first cutting instrument has transverse cutting guide surfaces for guiding a surgical saw during an initial cutting of the proximal tibia. The first cutting instrument also provides a stylus with an adjustable stylus member that can reference the proximal tibia before cutting begins. The surgeon then sets a selected depth of cut with the stylus and engages the proximal tibial surface with the stylus.

[0062] After the depth of cut has been set using the stylus, the proximal tibia is cut with a first transverse cut. During this first cut, the saw tracks the cutting guide surfaces and then engages the proximal tibial bone tissue. The first cutting instrument and its stylus are then removed.

[0063] A second cutting instrument is then mourned on the rod above the patients proximal tibia. The second cutting instrument has guide surfaces externally of the proximal tibia for guiding a surgical saw blade and a cutter thereon that includes multiple blades for cutting longitudinally into the proximal tibia. After the secondary cutting instrument is positioned to a selected depth within the proximal tibia, a secondary transverse cut is made on the proximal tibia using the secondary cutting instrument. The saw first tracks the guide surfaces externally of the proximal tibia and then tracks a cutting guide surface on the blades.

[0064] In the preferred method of the present invention, the primary and secondary cuts are made generally perpendicular to the rod and thus to the patient's intramedullary canal.

[0065] With the method of the present invention, the cutter on the secondary cutting instrument includes a plurality of flat blades that are thrust completely into the patient's proximal tibial bone tissue. The blades are imbedded in the proximal tibia. The top surface of the cutter blades is slightly below the surface of the first transverse cut. This allows the surgeon to use the secondary cutting instrument to track not only the secondary cutting instruments externally of the tibia but also to track a guide surface provided on the upper surface of the cutter blades that have been imbedded in the patient's proximal tibial bone tissue.

[0066] For a further understanding of the nature and objects of the present invention, reference should be had to the following detailed description, taken in conjunction with the accompanying drawings, in which like parts are given like reference numerals, and wherein:

FIGURE 1 is a perspective schematic view illustrating preliminary tibial preparation;

FIGURE 2 is a schematic perspective view illustrating attachment of an ankle damp and the preferred embodiment of the apparatus of the present invention illustrating the tibial cutting block and tibial stylus portions thereof.

FIGURE 3 is a perspective view illustrating the tibial cutting block and the tibial stylus portion of the preferred embodiment of the apparatus of the present invention;

FIGURE 4 is a fragmentary perspective view illustrating a cutting of the proximal tibial using the tibial

cutting block;
FIGURE 5 is a perspective exploded view illustrating the tibial cutting block and the tibial stylus portion of the preferred embodiment of the apparatus of the present invention;
FIGURE 6 is an exploded perspective view illustrating the tibial stylus;
FIGURE 6A is a sectional elevational fragmentary view illustrating the tibial stylus;
FIGURE 7 is a top view illustrating the tibial stylus portion of the preferred embodiment of the apparatus of the present invention;
FIGURE 8 is partial sectional view illustrating the tibial stylus;
FIGURE 9 is partial perspective view of the tibial stylus;
FIGURE 10 is a fragmentary view of the tibial stylus:
FIGURE 11 is another fragmentary sectional view of the tibial stylus;
FIGURE 12 is a fragmentary sectional view of the preferred embodiment of the apparatus of the present invention;
FIGURE 13 is a front elevational view of the tibial cutting block portion of the preferred embodiment of the apparatus of the present invention;
FIGURE 14 is a top view of the tibial cutting block of the preferred embodiment of the apparatus of the present invention;
FIGURE 15 is a sectional view of the tibial cutting block of the preferred embodiment of the apparatus of the present invention;
FIGURE 16 is a partial sectional view of the tibial cutting block of the preferred embodiment of the apparatus of the present invention;
FIGURE 17 is a perspective view illustrating placement of the tibial secondary prep-guide portion of the preferred embodiment of the apparatus of the present invention;
FIGURE 18 is a perspective view illustrating the tibial secondary prep-guide and a secondary finishing of the proximal tibia;
FIGURE 19 illustrates installation of a trial tibial prosthesis in the patient's proximal tibia;
FIGURE 20 illustrates the trial femoral prosthesis and the trial tibial prosthesis installed respectively on the patient's distal femur and proximal tibia and prior to rotation to the tibial trial prosthesis;
FIGURE 21 is a perspective view of the tibial secondary prep-guide portion of the preferred embodiment of the apparatus of the present invention;
FIGURE 22 is a frontal elevational view of the tibial secondary prep-guide;
FIGURE 23 is an elevational side view of the tibial prep-guide;

[0067] Figures 1-4 illustrate a preliminary preparation of the patient's distal tibia as part of the method of the present invention. In Figure 1, the patient's tibia 10 is shown as is the proximal tibia 11. A drill 13 is used to track the patient's intramedullary canal 12 for receiving a reamer 21. Also shown in Figure 1 is the patient's femur 14 that has already been surgically prepared to receive a trial femoral prosthesis. The distal femur 15 is typically prepared with anterior and posterior cuts that are parallel to each other, a distal cut that is generally perpendicular to the anterior and posterior cuts, and diagonally extending chamfer cuts that extend between the distal cut and the respective posterior and anterior cuts.

[0068] In Figure 2, an ankle damp 16 has been installed at the patient's ankle 17 and with an alignment sleeve 18 that is positioned generally parallel to the patient's tibia. The sleeve 18 provides a coupling 19 for farming a connection with the bottom of tibial cutting guide 20 of the present invention. Ankle damps 16 are commercially available and can be seen for example in the Steele patent 5,197,944, incorporated herein by reference.

[0069] In Figure 3, the tibial cutting guide 20 can be seen placed adjacent the patient's proximal tibia 11. In Figures 3 and 5-6. the tibial cutting guide 20 can be seen attached to the tibial stylus 50, and the assembly of cutting guide 20 and stylus 50 being attached to reamer 21 mounted in the patient's intramedullary canal. Stylus 50 is shown more particularly in Figures 5-12. Cutting block 20 is shown more particularly in Figures 13-16.

[0070] Cutting block 20 includes a block body 22 that includes a pair of upper flanges 23 and a pair of lower flanges 24. Slots 25, 26 extend between the upper flanges 23 and the lower flanges 24. The slots 25, 26 provide a guide for a flat cutting blade such as the cutting blade 73 shown in Figure 4 which can be a commercially available powered saw. The saw blade 73 cuts through the patient's proximal tibia 11 as shown in Figure 4 along a fine 74 that is generally perpendicular to the patient's intramedullary canal. In Figure 4, the block 22 has been attached to the proximal tibia 11 using a plurality of bone spikes 30.

[0071] Tibial cutting block 20 further provides a center portion 22 that can be used to attach the cutting block 22 to the tibial stylus 50 and to ankle clamp 18 at coupling 19. Cutting block body 22 provides a lower attachment portion 28 having a plurality of cylindrical bores 29 therethrough as shown in Figures 13 and 14. These cylindrical openings 29 provide a cylindrical shape that corresponds generally to the outer configuration of a bone spike 30. One or more bone spikes can be placed through a corresponding plurality of the openings 29 for affixing the block 22 to the patient's proximal tibia after alignment has been accomplished using elongated reamer rod 21 placed in the patient's intramedullary canal, the stylus 50, and ankle damp 16.

[0072] Vertical rod 31 extends from coupling 19 to center portion 27 of tibial cutting block 22. A set screw 32 threadably engages opening 33 of central portion 28 of cutting block 22. Cylindrical socket 34 receives the

upper end of vertical rod 31. The set screw 32 can be tightened against the rod as it occupies the cylindrical socket 34.

[0073] An upper cylindrically-shaped internally threaded opening 35 allows the cutting block 22 to be attached to tibial stylus 50. Vertical post 36 extends between stylus 50 and cutting block 22. The post 36 has a central longitudinal axis that is perpendicular to the plane defined by slots 25,26. Further, the central longitudinal axis of post 36 is parallel to the central longitudinal axis of reamer rod 21 that is mounted in the patient's intramedullary canal. The post 36 has a lower end 37 with a pair of flanges 38, 39 having a recess 40 therebetween.

[0074] An upwardly projecting portion 41 of the center portion 28 of cutting block 22 registers in the recess 40. Further, the flanges 38,39 closely conform to the projecting portion 41 upon assembly. A threaded connection can be used to form a connection between the threaded opening 35 and bolt 49 that extends through vertical bore 46 of vertical post 36. A bolted connection can be used to assemble the vertical post 36 to the cutting block 22, for example.

[0075] A pair of shoulders 44, 45 at the upper end of vertical post 36 register in an elongated slot 53 on tibial stylus 50. The upper end 43 of post 36 has a transverse cross section that corresponds in size and shape to the transverse cross section of the longitudinally extending slot 53. Slot 53 extends through horizontal beam 51 oF tibial stylus 50. The slot 53 communicates with a longitudinal opening 52 in the upper surface of the horizontal beam 51. A transverse probe holder 54 extends at generally right angles to the beam 51. A bushing 55 extends upwardly from the connection between beam 51 and probe holder 54. The bushing 55 provides a vertical open ended bore 56 that receives reamer 21. Set screw 57 can be used to tighten bushing 55 and the entire tibial stylus 50 to reamer 21. Internally threaded opening 70 receives the set screw 57.

[0076] Probe holder 54 includes a pair of sides 58, 59 each having an elongated vertically extending probes 60, 61 respectively. The probe holder 54 has an upper generally flat surface 62 that is perpendicular to the central longitudinal axis of bore 56 and to the central longitudinal axis reamer rod 21. Each probe 60, 61 moves vertically in an opening 66, 67 respectively. A pair of horizontal openings 68. 69 carry detent locking members 63, 64 respectively. The detent locking members 63, 64 can be spring loaded with sprpings 97, 88. Each of the detent locking members 63, 64 have openings that allow the probes 60, 61 to pass therethrough. Each probe 60, 61 provides a plurality of vertically spaced teeth 76 thereon (see Figure 6). Spaces between the teeth 76 are engaged by the respective detent locking member 63, 64 at stop 96 when they are released, thereby affixing the position of each of the probes 60, 61 relative to the probe holder 54. A stop pin 101 holds each detent locking member 63, 64 in its opening 68, 69.

[0077] Longitudinal opening 52 is surrounded by side walls 72 and by longitudinally extending shoulders 71. This allows the placement of a bolt 49 into slot 52 and through the center of vertical bore 46 of vertical post 36 for attaching to threaded opening 35. Further, the hood 43 of the bolt 49 nests on the shoulder 71 transferring load thereto.

[0078] In Figures 17-18 and 21-23, there can be seen tibial secondary prep guide 75. Guide 75 has an instrument body 76 that includes a pair of spaced apart vertical posts including the post 77 and the post 82. Post 77 carries a cylindrical cutting element 76 with a plurality of circumferentially spaced and radially extending cutting blades 79-81. The post 82 supports a pair of flanged portions including upper flanges 83 and lower flanges 84.

[0079] A pair of flat cutting blade guide slots 85, 86 are positioned between the upper flanges and the lower flanges 83, as shown in Figures 21-23. During use, the surgeon places the tibial secondary prep guide over the reamer 21 that is installed in the patient's intramedullary canal. This registers the three cutting blades 79-81 and the cylindrical cutting element 78 at the center of the patient's proximal tibia 11, as shown In Figure 17.

The surgeon hammers the flat side 88 of instrument body 76 driving the cutting blades 79-81 into the proximal tibia 11 as shown in Figures 17-18. The surgeon hammers the surface 88 until the blades 79-81 are just beneath the surface of proximal tibia 11 as shown in Figure 18. This allows the surgeon to shave a layer of tissue from proximal tibia 11 with great precision. The saw blade 89 is supported not only by the flanges 83, 84, but also by the upper surfaces 90 of blades 79-81 which are in a common plane with the upper surface 91 of the flange 84, as shown in Figure 31. The dotted line 102 in Figure 21 shows the path taken by saw blade 89 to secondarily cut the proximal tibia.

[0080] After the secondary cut is made to the proximal tibia 11, a trial prosthesis can be installed on the patient's distal tibia 11. In Figures 19-20, a tibial trial prosthesis 92 is shown as installed into the patient's intrameduliary canal 12. The tibial trial prosthesis 92 can include three components, a metallic plate or tray 93, a stem or plug 94, and a plastic trial insert 95. In Figure 20, a tibial prosthesis 92 has been installed by the surgeon on the patient's proximal tibial 11. The surgeon has also installed a trial femoral prosthesis 100 on the distal femur 15.

[0081] The following table lists the parts numbers and parts descriptions as used herein and in the drawings attached hereto.

PARTS LIST	
Part Number	Description
10	tibia
11	proximal tibia

(continued)

PARTS LIST	
Part Number	Description
12	intramedullary canal
13	drill
14	femur
15	distal femur
16	ankle damp
17	ankle
18	alignment eleave
19	coupling
20	tibial cutting guide
21	elongated reamer rod
22	cutting block body
23	upper flange
24	lower flange
25	horizontal slot
26	horizontal slot
27	center portion
28	attachment portion
29	cylindrical bores
30	bone spikes
31	vertical rod
32	set screw
33	internally threaded opening
34	cylindrical socket
35	internally threaded opening
36	vertical post
37	lower end
38	flange
39	flange
40	recess
41	projecting portion
43	head
44	shoulder
45	shoulder
46	vertical bore
47	recess
48	recess
49	bolt
50	tibial stylus
51	horizontal beam
52	longitudinal opening
53	longitudinal opening
54	probe holder
55	bushing
56	vertical open ended bore
57	set screw
58	side
59	side
60	probe

(continued)

PARTS LIST	
Part Number	Description
61	probe
62	flat surface
63	detent locking member
64	detent locking member
65	bolted connection
66	opening
67	opening
68	horizontal opening
69	horizontal opening
70	internally threaded opening
71	longitudinally extending shoulder
72	side wall
73	saw blade
74	transverse cut
75	tibial secondary prep guide
76	body
77	vertical post
78	cylindrical cutting element
79	blade
80	blade
81	blade
82	vertical post
83	upper horizontal flange
84	lower horizontal flange
85	cutting guide slot
86	cutting guide slot
87	open ended vertical bore
88	flat surface
89	blade
90	upper surface
91	upper surface
92	trial prosthesis
93	tray
94	stem
95	insert
96	stop
97	spring
98	spring
99	opening
100	opening
101	stop pin
102	transverse cutting plane

[0082] Because many varying and different embodiments may be made within the scope of the inventive concept herein taught, and because many modifications may be made in the embodiments herein detailed in ac-

cordance with the descriptive requirement of the law, it is to be understood that the details herein are to be interpreted as illustrative and not in a limiting sense

Claims

1. A cutting guide (75) for resecting a proximal tibia of a patient to receive a tibial prosthesis, the cutting guide comprising:

   a) an instrument body (76);
   b) mounting means for attaching the cutting guide to a rod (21) that tracks the patient's intramedullary canal (12) which enables a surgeon to reference surgical cuts with respect to the patient's intramedullary canal;
   c) a cutting element (78) for being driven longitudinally into the proximal tibia during use; and
   d) at least one cutting guide surface (90,91) for guiding a saw instrument (89) of the surgeon.

2. A cutting guide according to claim 1, wherein the instrument body (76) is generally U-shaped.

3. A cutting guide according to claim 1 or claim 2, wherein the instrument body comprises a first post (77) and a second post (82), said posts being spaced apart from each other along the instrument body (76) and orientated in the same direction as each other.

4. A cutting guide according to claim 3, wherein the second post (82) supports a pair of flanged portions (83, 84).

5. A cutting guide according to claim 4, wherein the flanged portions include upper flanges (83) and lower flanges (84), said lower flanges providing an upper surface (91).

6. A cutting guide according to claim 5, wherein the upper surface (91) provides a first cutting guide surface.

7. A cutting guide according to any of claims 3 to 6, wherein the cutting element (78) is disposed at an end of the first post (77).

8. A cutting guide according to any of claims 3 to 7, wherein the cutting element (78) comprises a plurality of blades (79, 80, 81), at least one of said blades comprising an upper surface which provides a second cutting guide surface (90).

9. A cutting guide according to claim 8, wherein the first cutting guide surface (91) and the second cutting guide surface (90) are in a common plane (102).

10. A cutting guide according to claim 8 or claim 9, wherein the blades are radially spaced.

11. A cutting guide according to any preceding claim, wherein a portion of the instrument body comprises an anvil portion (88) for enabling a user to use a hammer to drive the cutting element (78) into the tibia during use.

12. A cutting guide according to any previous claim, wherein the mounting means comprises a bore (87) which is open at both ends to enable the instrument to be mounted on the rod (21) during use and enable the cutting element (78) to be placed at the centre of the proximal tibia of the patient.

13. A cutting guide according to claim 12, wherein the bore (87) is generally cylindrical.

14. A cutting guide according to claim 12 or claim 13, wherein the bore (87) extends longitudinally through the first post (77) and the cutting element (78).

15. A cutting guide according to any of claims 8 to 14, wherein the second cutting guide surface (90) occupies a plane that intersects the rod axis.

16. A cutting guide according to any of claims 8 to 15 when dependent on claim 6, wherein the first cutting guide surface (91) and the second cutting guide surface (90) enable the saw instrument of the surgeon to initially track the second cutting guide surface (90) externally of the proximal tibia of the patient and then track the first cutting guide surface (91) embedded in the patient's tibia to enable the surgeon to shave a layer of tissue from the surface of the proximal tibia.

17. A cutting guide according to any of claims 8 to 16 when dependent on claim 6, wherein the first cutting guide surface (91) and the second cutting guide surface (90) are arranged such that the saw instrument tracks at least one of said surfaces during use.

18. A tibial cutting guide for resecting a patient's proximal tibia to receive a tibial prosthesis comprising:

   a) an instrument body having a transverse cutting guide surface thereon for guiding a surgeon's cutting instrument during reshaping of a patient's proximal tibia to receive a tibial prosthesis member;
   b) a blade member for forming a connection between the instrument body and the patient's proximal tibia, said blade member having a cut-

ting edge that cuts into the medullary tissue of the patient's proximal tibia during use, embedding the blade in the medullary tissue;
c) a rod (21) for tracking the patient's intramedullary canal, said rod being connectable to the instrument body so that the first cutting guide surface is referenced to the patient's intramedullary canal;

and wherein the blade member has a second cutting guide surface (90) that defines a plane with the first cutting guide surface (91) so that the cutting instrument engages both the first cutting guide surface and the second cutting guide surface during use.

19. A tibial cutting guide according to claim 18 further comprising any one or more of the features disclosed in any one of claims 2 to 17.

20. A tibial cutting guide instrument for resecting a patient's proximal tibia to receive a tibial prosthesis comprising;

a) A rod (21) arranged to track an intramedullary canal of a patient so that the rod enables a surgeon to reference surgical cuts with respect to the intramedullary canal of the patient;
b) a first cutting guide (20) for guiding a surgical saw during an initial cutting of the patient's proximal tibia; and
c) second cutting guide for enabling the surgeon to shave a layer of tissue from the patient's proximal tibia (75);

wherein the first cutting guide (20) and the second cutting guide (75) are separately and independently mountable on the rod (21).

21. An instrument according to claim 20, wherein the second cutting guide comprises the cutting guide of any one or more of claims 1 to 17.

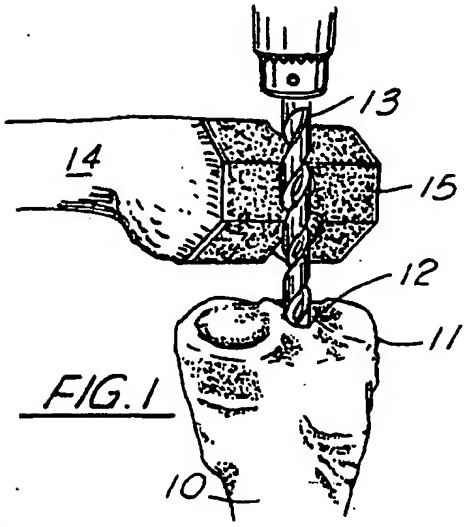

FIG. 1

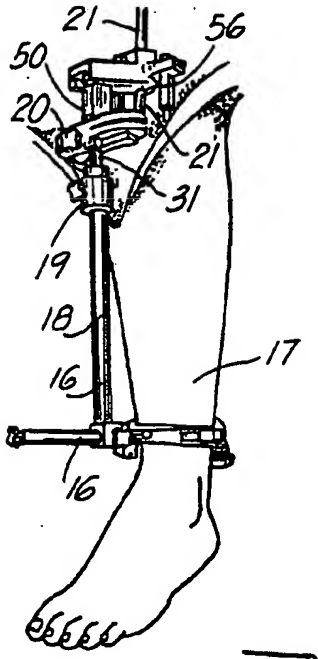

FIG. 2

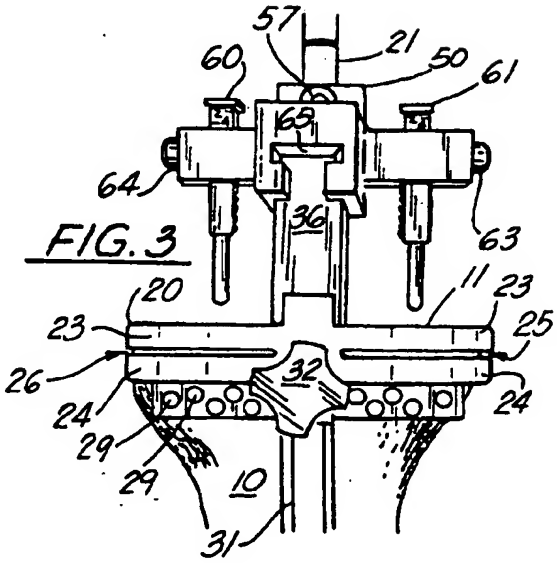

FIG. 3

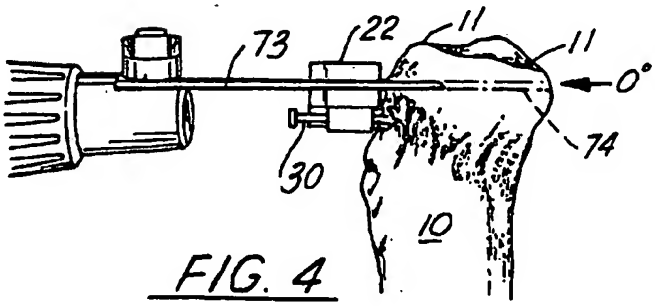

FIG. 4

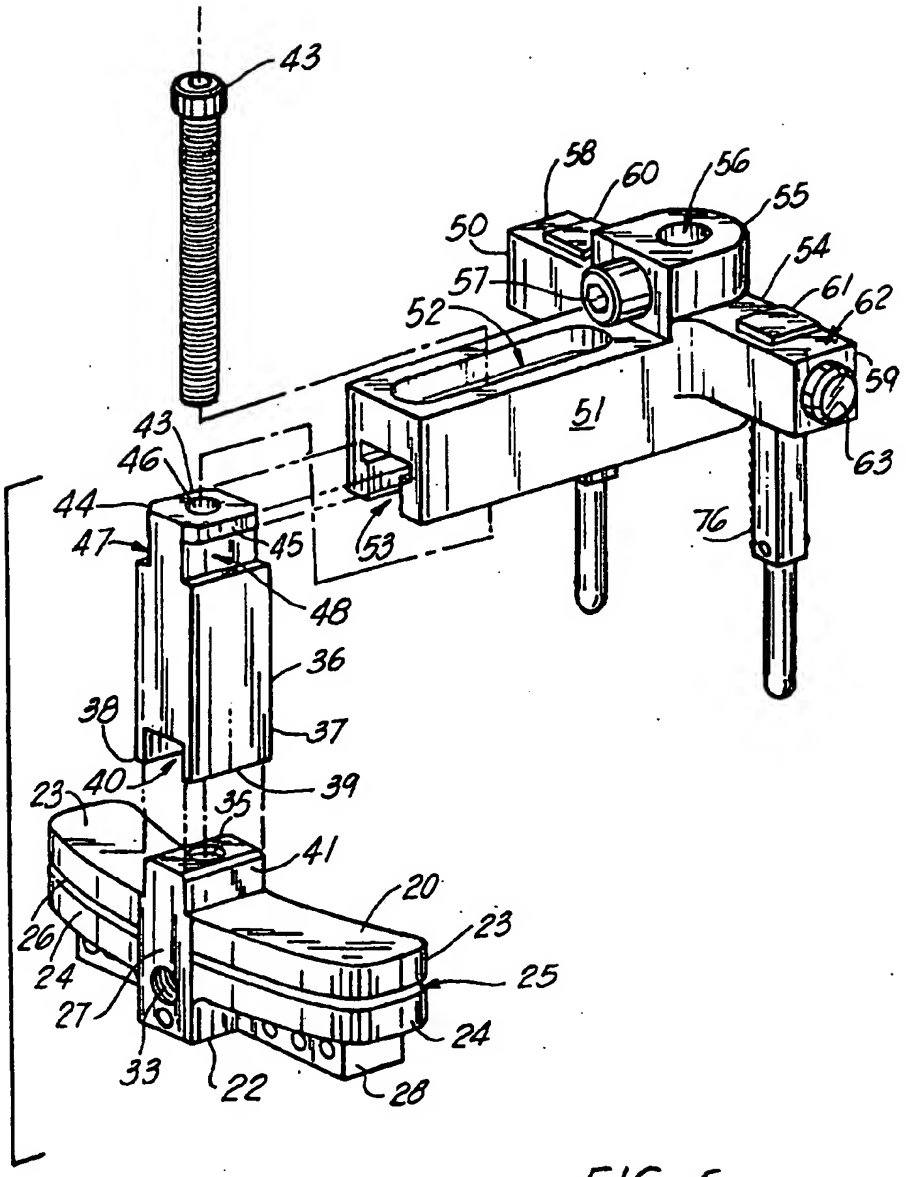
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FIG. 5

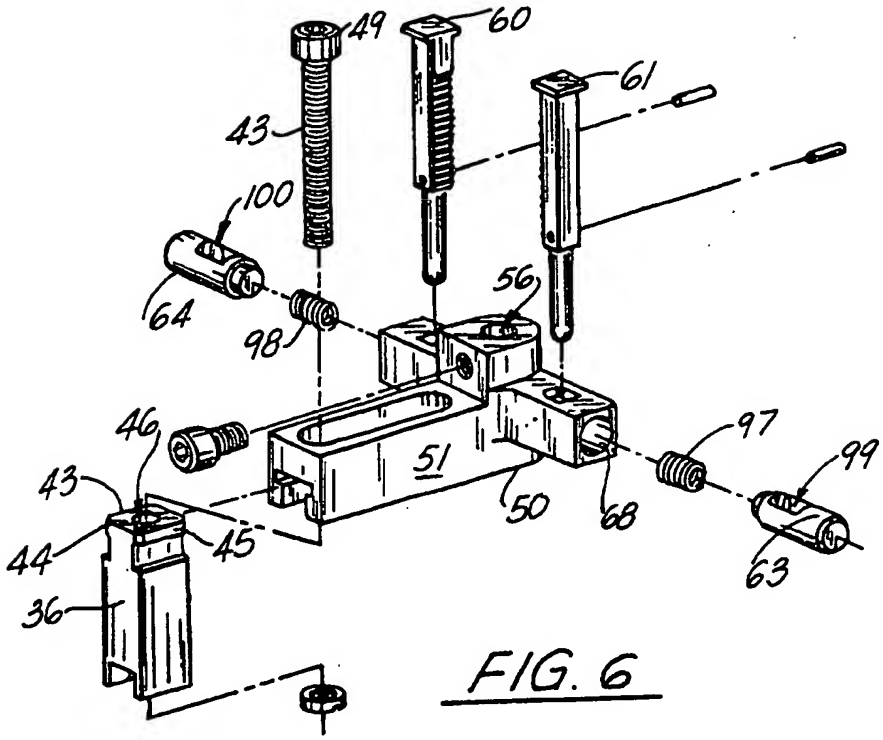
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FIG. 6

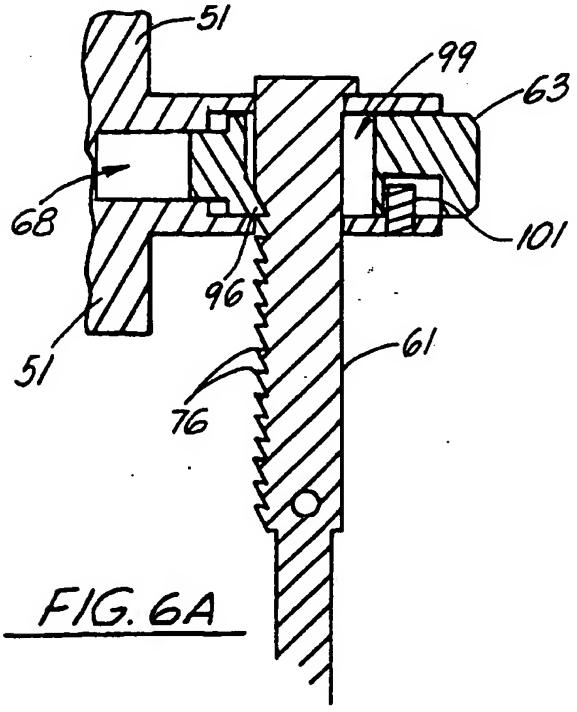
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FIG. 6A

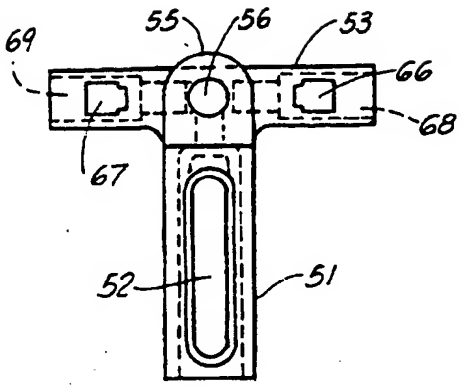

FIG. 7

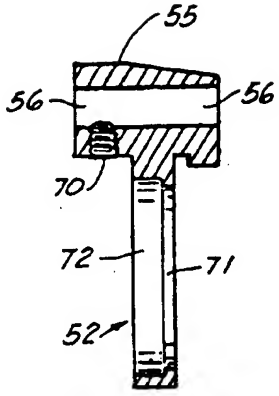

FIG. 8

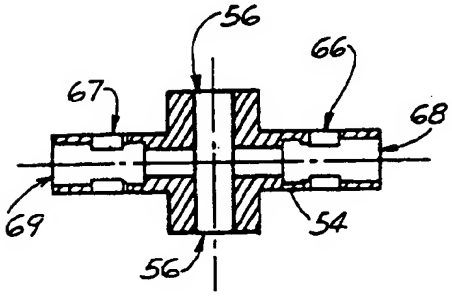

FIG. 9

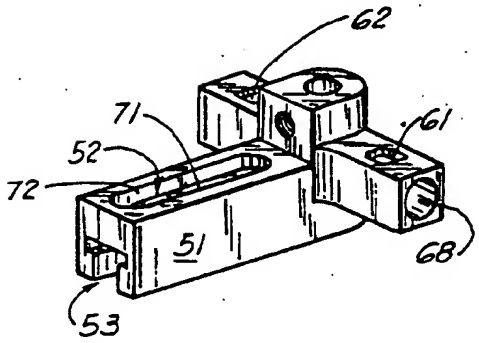

FIG. 10

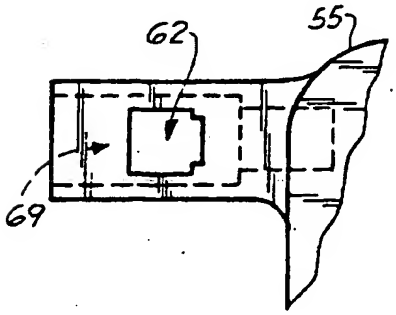

FIG. 11

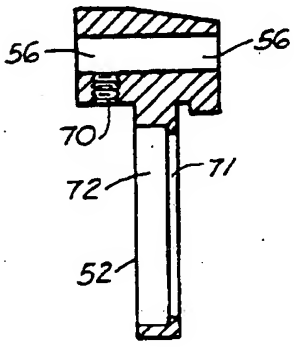

FIG. 12

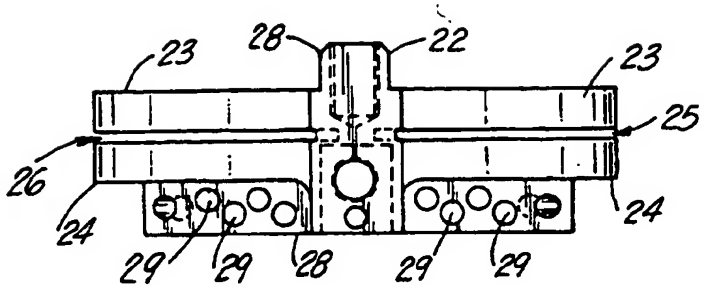

FIG. 13

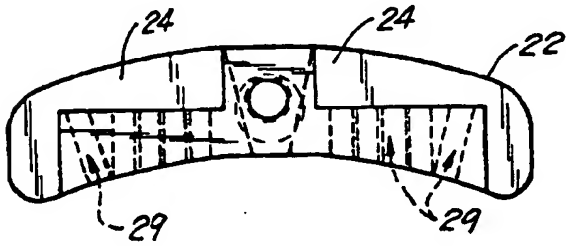

FIG. 14

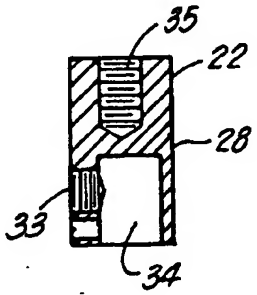

FIG. 15

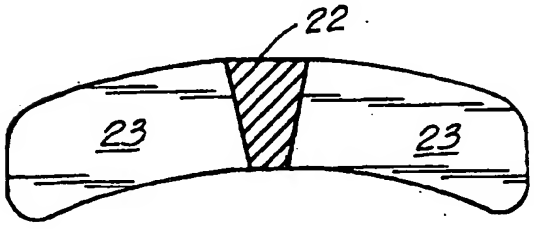

FIG 16

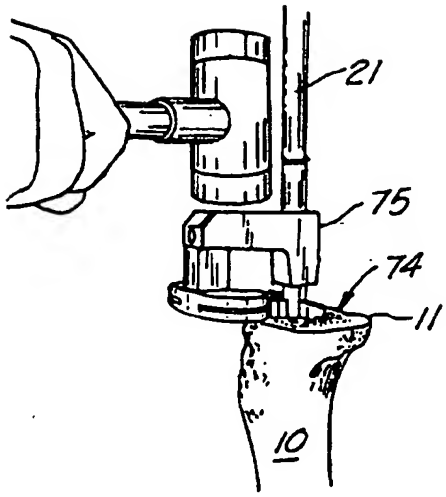

FIG. 17

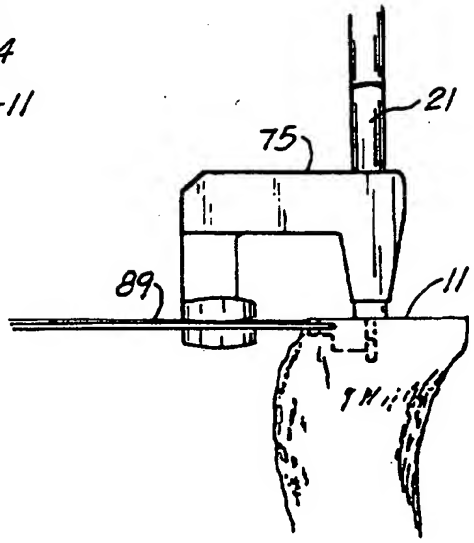

FIG. 18

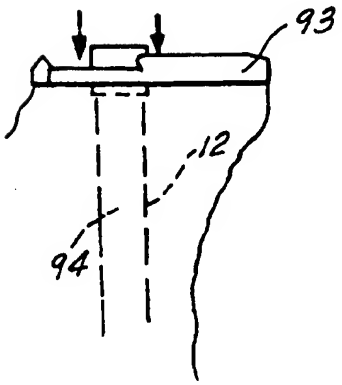

FIG. 19

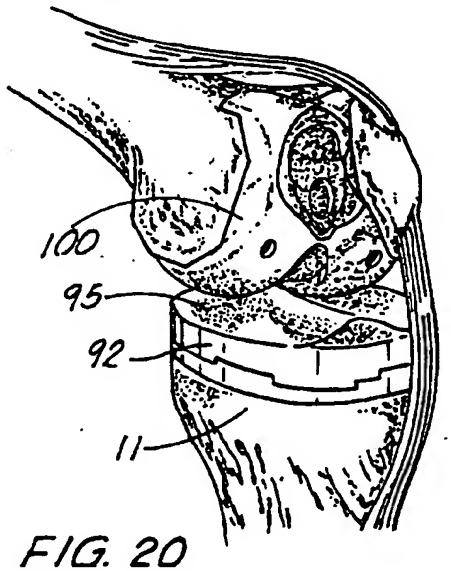

FIG. 20

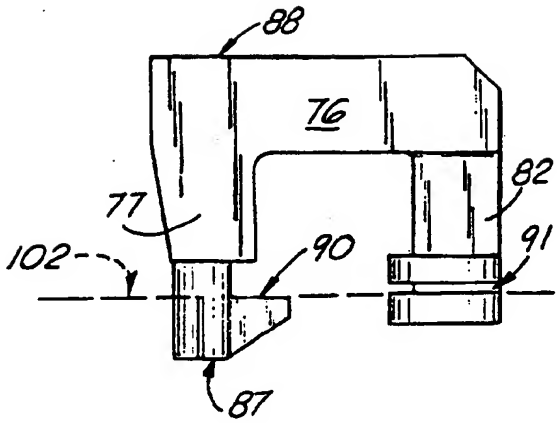

FIG. 21

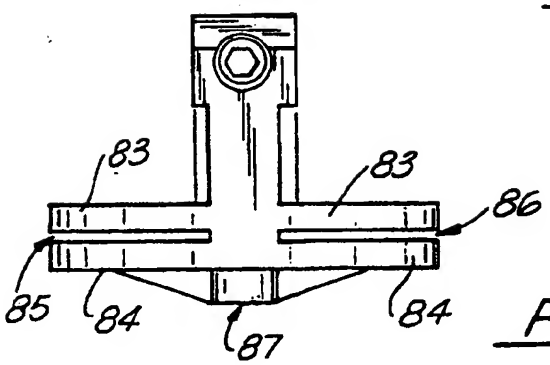

FIG. 22

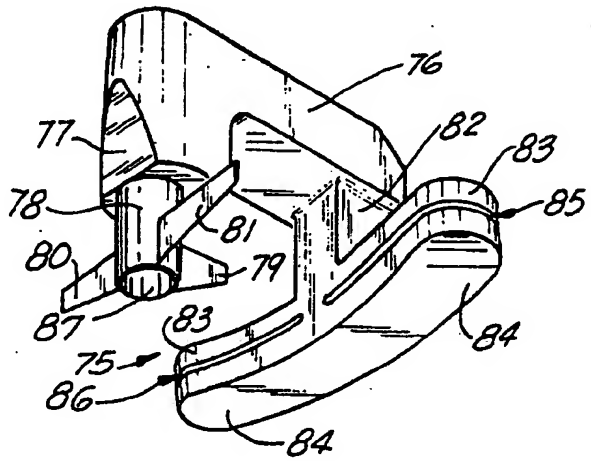

FIG. 23